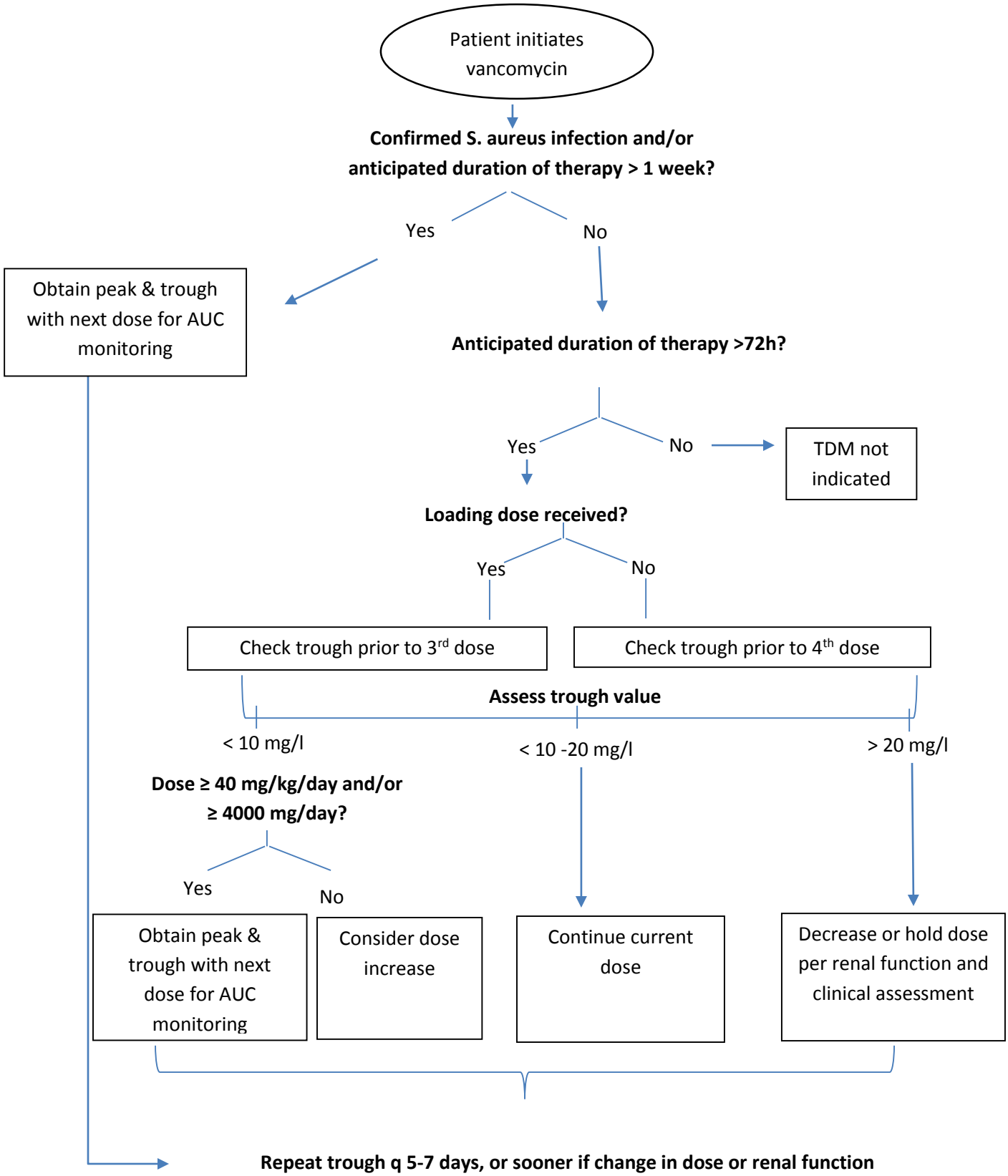
I. Decision Tree for Therapeutic Drug Monitoring*



**Patient must have stable renal function*

II. Vancomycin AUC Monitoring FAQ & Troubleshooting:

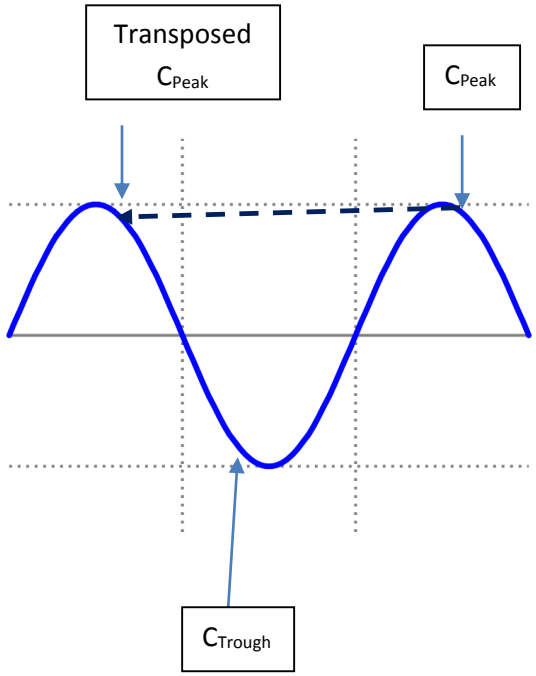
Q: I have a trough drawn before the 4th dose and a peak drawn after the same dose. How do I determine the time between the two levels?	**A.** As long as the patient has stable renal function and is at steady state, you can transpose the concentration so it looks like it is from the same dosing interval. See Figure 2 below.
Q: Does the patient have to have normal renal function in order to use the AUC calculator?	**A. No.** Renal function does not have to be normal, but it does have to be STABLE. If renal function is unstable, then the calculator will not be reliable.
Q: The trough and peak were drawn incorrectly, do I have to repeat the draws before I can calculate the AUC?	**A. No.** As long as the peak wasn't drawn during the infusion, you can adjust for the 'incorrect' timing by noting the time between concentrations and/or time to peak & trough in the AUC calculator. (Figure 1)
Q: The trough is going down and I don't feel comfortable not increasing the dose even though this calculator tells me that I'm at the right AUC.	**A.** If the patient is clinically stable and/or improving, then increasing the dose per trough is unnecessary. If the patient is clinically worsening, is critically ill, and/or the cultures have not cleared, then the dose may need to be increased or therapy switched to an alternate agent such as linezolid or daptomycin.
Q. How frequently should I monitor vancomycin troughs after I determine the AUC? **Do I need to obtain peaks and troughs for monitoring?**	**A.** Monitor trough concentrations q 5 –7 days. The trough is being measured simply to ensure safety not efficacy. There is no need to obtain peaks unless renal function significantly changes (improves) and/or there is concern for appropriate AUC achievement.

Figure 1: Adjusting for incorrect timing of peak and trough:

VANCOMYCIN AUC CALCULATOR	Input	Dosing parameter
Dose	1000	mg
Dosing interval	12	hours
Concentration$_1$ (Cmax)	26.7	mg/l
Concentration$_2$ (Cmin)	7.3	mg/l
ΔT	11	Time between concentrations 1 and 2 (hours)
T_1	1.0	Time from end of infusion to C_1 (hours)
T_2	-1.0	Time from C_2 to next dose (hours)

The trough in this case was drawn an hour late (i.e. after the dose was due) this is corrected with a negative sign:

Figure 2: Transposing a peak and trough from 2 dosing intervals to 1



Both peak and trough concentrations need to be in the same dosing interval (in real life or via transposition) in order to calculate ΔT.

1. Confirm patient is at steady state
2. Determine the time the peak was drawn AFTER the drug infusion
3. Move the peak to the previous dosing interval the same amount of time AFTER the drug infusion
4. After moving the peak, determine ΔT, the time BETWEEN the 2 concentrations (new peak and old trough)

III. Example AUC Calculations

A. 38F, weighing 49.1 kg initiated on vancomycin empirically for neutropenic fever. Renal function stable and unimpaired.

(a) Initial dose: Vancomycin 1000 mg IV q 12h

(b) Vancomycin trough drawn before the 5th dose = 7.3 mg/l

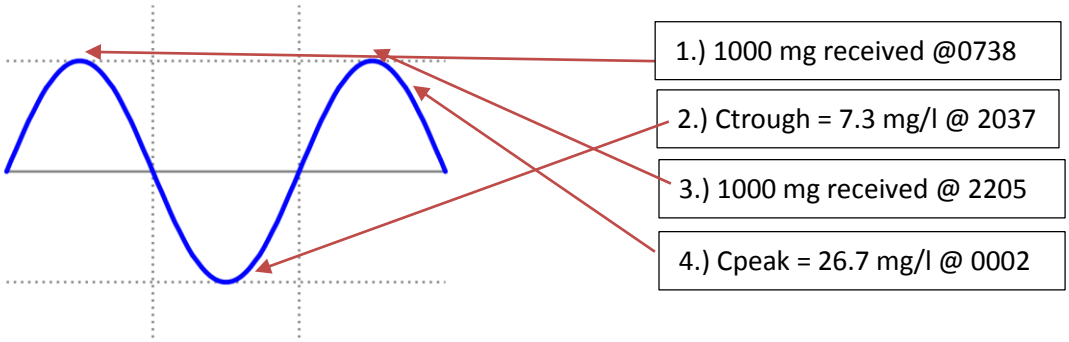
1. Since she is already on 40 mg/kg/day and trough < 10 mg/l, a peak is ordered for AUC monitoring

(c) Peak drawn after 5th dose = 26.7 mg/l

(d) Use transposition to determine the time between concentrations

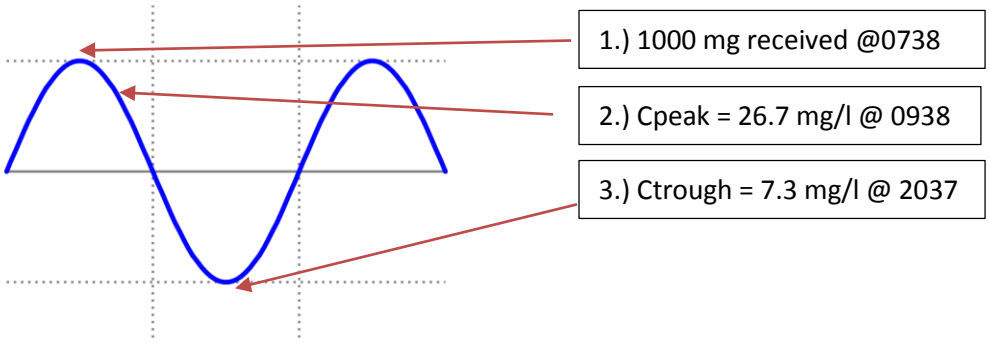
1. Inclusion criteria: stable renal function, @ steady state concentration

A. Map actual doses and concentrations given



B. Move Cpeak to the previous dosing interval

a. Determine the number of hours after the dose/infusion when the Cpeak was drawn
   i. Cpeak drawn 2 hours after dose initiated
b. After assessing the time of the peak in relation to the previous dose, assign this peak to the previous dosing interval
   i. 1000 mg received @ 0738, Cpeak drawn 2 hours later = 0938



C. Calculate AUC [***If both concentrations were drawn during the same dosing interval, skip steps A & B***]

1. You may need to double check work and/or use a separate calculation method if the AUC calculator recommends doses that are:

> 40-50 mg/kg and/or

≥ 2x current dose and/or

> 4000 mg

2. Three options

(a) By hand

(b) By VMC electronic spreadsheet

A	B	C
VANCOMYCIN AUC CALCULATOR	**Input**	**Dosing parameter**
Dose	1000	mg
Dosing interval	12	hours
Concentration$_1$ (Cmax)	26.7	mg/l
Concentration$_2$ (Cmin)	7.3	mg/l
ΔT	11	Time between concentrations 1 and 2 (hours)
T_1	1.0	Time from end of infusion to C_1 (hours)
T_2	-1.0	Time from C_2 to next dose (hours)
Calculated fields		
ke	0.12	hours^{-1}
Estimated half-life	5.88	hours
Cmax	30.04	mg/l
Cmin	8.21	mg/l
Dosing interval AUC	204	mg/l
24-hour AUC	409	Goal 24h AUC = 400 [350 - 650] mg/l
DOSE CHANGE INDICATED?	FALSE	DOSING
Dose Change (decrease)	FALSE	Round to nearest 250mg
Dose Change (increase)	FALSE	Divided over 24 hours

(c) By other online tools

1.) ClinCalc http://clincalc.com/vancomycin/

[Updated 8/24/16]

Vancomycin Calculator

Advanced vancomycin pharmacokinetics tool

ClinCalc.com » Infectious Disease » Vancomycin Calculator

Patient Parameters

Body weight: 49.1 kg lbs

Volume of distribution (Vd): 0.7 L/kg

Therapeutic goal: AUC:MIC ratio > 400

Recommend loading dose: No Yes

Elimination Constant (Kel)

Empiric Estimation | Based on One Level | Based on Two Levels

Note: This estimation assumes that no vancomycin has been given between the two levels.

First level: 26.7 mcg/mL

Second level: 7.3 mcg/mL

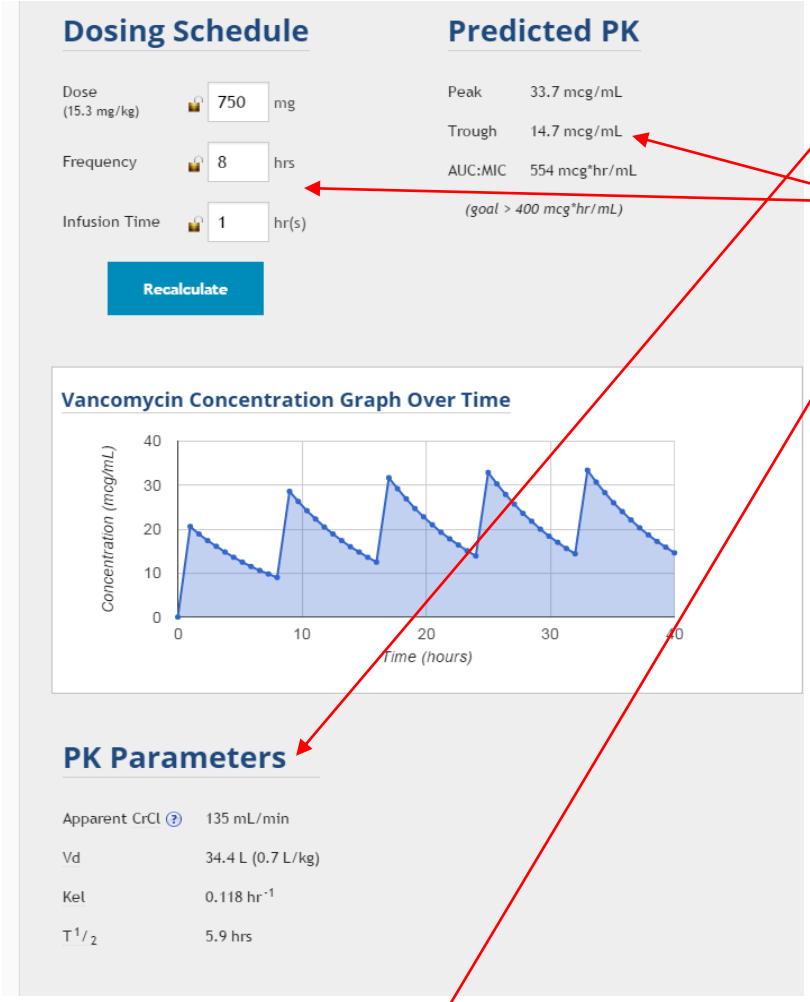
Time between first and second levels: 11 hours

Reset | Calculate

Advanced Settings

1.) Enter patient weight
2.) No need to adjust Vd
3.) Select therapeutic goal: AUC/MIC > 400
4.) No loading dose
5.) Select “based on two levels”
6.) Calculate

[Updated 8/24/16]



1.) In PK Parameters: Check ke and t ½ (same as VMC calculator, makes sense clinically 26.7 →7.3 in ~2 half-lives)
2.) NOTE: The dosing schedule will default to a dose that achieves a trough ≥15
3.) Adjust the Dosing Schedule to what the patient is currently getting.
4.) There will be some variation between the calculators